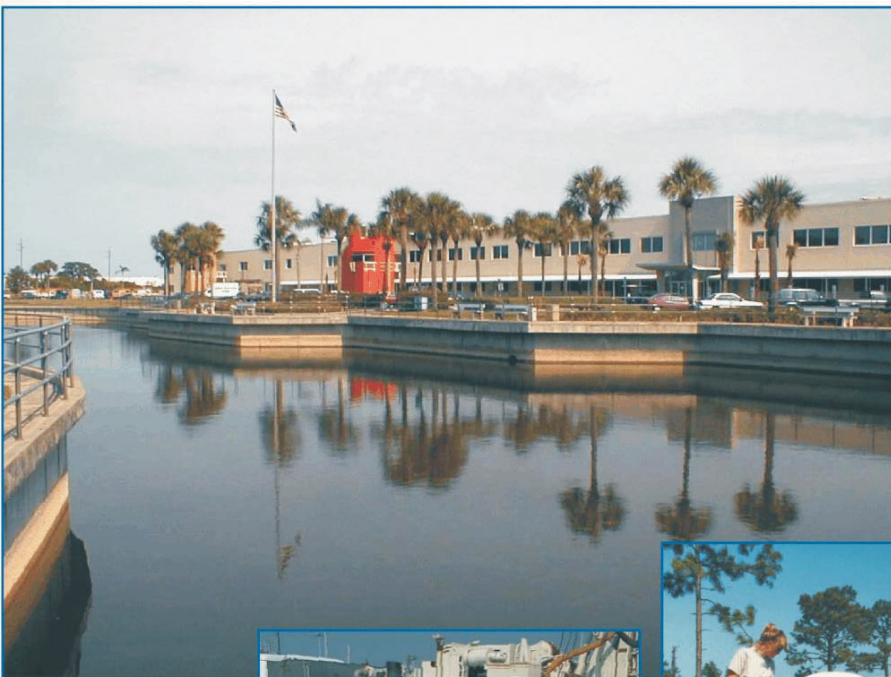


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# Environmental Restoration Activities at the Young-Rainey STAR Center



U.S. Department of Energy

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August 2002

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*Front cover photographs*

*Clockwise from upper left: Building 100 at Young-Rainey STAR Center, Florida.*

*Rotary steam stripping project at Northeast Site.*

*Sampling activities at 4.5-Acre Site.*

*Sampling activities at Wastewater Neutralization Area.*

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*View to northeast of Young-Rainey STAR Center (early 1990s).*





## Introduction

With the end of the Cold War, the U.S. Department of Energy (DOE) diversified its mission from day-to-day management and integration of nuclear weapons activities to stewardship and maintenance of the nation's nuclear weapons stockpile, former weapons plants, and support facilities.

Until September 1994, the mission of the DOE Pinellas Plant near St. Petersburg, Florida, was production of components for nuclear weapons. After September 1994, the DOE mission at the Pinellas Plant was reduced to environmental management. DOE sold the facility to the Pinellas County Industrial Council on March 17, 1995, in keeping with its desire to contribute to economic development in the Tampa Bay region. On July 1, 1999, the Pinellas County Industrial Council was disestablished by the State of Florida and ownership of the Pinellas Plant changed to the Pinellas County Board of Commissioners. The facility, now known as the Young-Rainey Science, Technology, and Research (STAR) Center, houses more than 20 businesses that range from administrative to light manufacturing.

## Environmental Restoration Project Mission

The DOE environmental management mission at the STAR Center is completion of the DOE Environmental Restoration Project at the site. Current project objectives are expeditious and cost-effective cleanup of soil and groundwater contamination in full compliance with local, State, and Federal rules, regulations, and policies. Administration of DOE environmental restoration activities at the STAR Center is the responsibility of the DOE Idaho Operations Office and is managed by the DOE Grand Junction Office.

Cleanup is being conducted under the U.S. Environmental Protection Agency (EPA) Resource Conservation and Recovery Act (RCRA) Corrective Action Program and the Hazardous and Solid Waste Amendments of 1984. The State of Florida received authorization from EPA to implement the Hazardous and Solid Waste Amendments Corrective Action Program on November 17, 2000. This legislation requires DOE to investigate and perform remediation activities in those areas at the STAR Center and the 4.5-Acre Site that are contaminated with hazardous materials resulting from DOE operations. The 4.5-Acre Site is a former portion of the Pinellas Plant that is now privately owned.

## Location

The STAR Center is located in Pinellas County, Florida, between the cities of Clearwater and St. Petersburg. Pinellas County is situated along the west central coastline of Florida on a peninsula that separates Tampa Bay from the Gulf of Mexico. The city of Tampa is located approximately 30 miles east of the STAR Center. Structures and paved areas occupy about 35 percent of the 99-acre site; the remainder of the parcel is open space. The site is bordered on the north by light industry and vacant land, on the east by Belcher Road (County Road 135), on the west by the CSX, Inc., railroad tracks, and on the south by Bryan Dairy Road.

## History

The Pinellas Plant was built in 1956 as part of the DOE nuclear weapons research and development program in response to the need for a facility to manufacture neutron generators for use in nuclear weapons. While neutron generators were the principal products of the Pinellas Plant, other products were added over the years, such as thermal batteries, specialty capacitors, crystal resonators, neutron detectors, lightning arrestor connectors, vacuum switch tubes, and other special mechanical and electronic components.

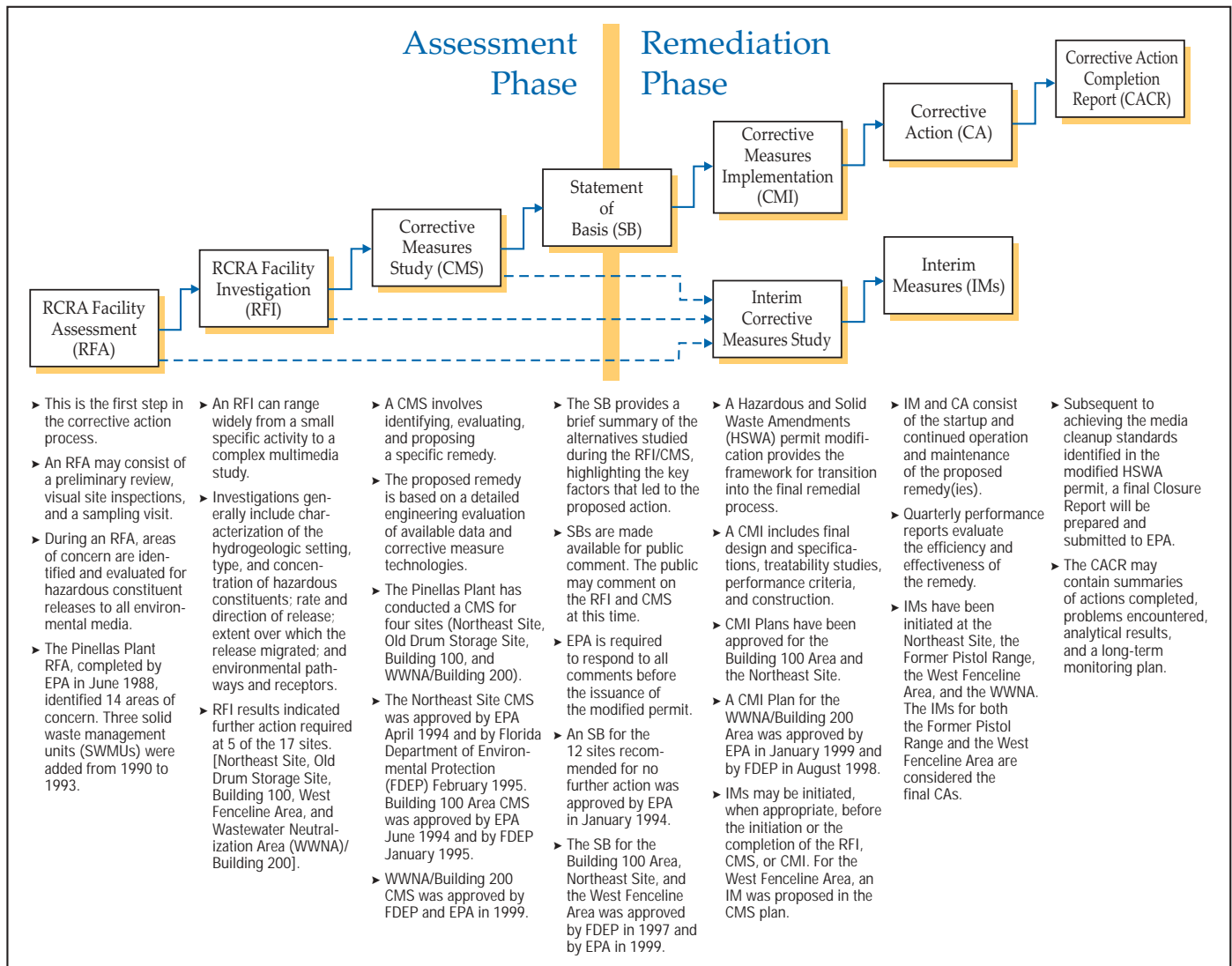
The types of waste generated at the Pinellas Plant as a result of production activities were consistent throughout the history of the plant. Waste types were categorized as industrial and sanitary wastewater, liquids, and solids. These waste types were segregated as hazardous, nonhazardous, or sanitary waste at the time of generation, but no true definition of hazardous waste was available in the 1950s, 1960s, and early 1970s.

Identifying and regulating the management of hazardous waste became an important public concern in the 1970s. The Federal Government responded to this concern by amending the Solid Waste Disposal Act with RCRA in 1976. This act focuses on requirements for managing hazardous waste, defines hazardous waste, and provides requirements for the treatment, storage, and disposal of this type of waste. The Solid Waste Disposal Act and RCRA were further amended by the Hazardous and Solid Waste Amendments of 1984. One requirement of the new amendment applied to the Pinellas Plant. As an interim status facility for hazardous waste, the Pinellas Plant had to be assessed for problems related to historical hazardous-waste releases.

In 1987, EPA performed a RCRA Facility Assessment to identify potential historical hazardous-waste releases at the plant. This assessment identified 15 sites that may have been contaminated by historical activities. EPA, in a Hazardous and Solid Waste Amendments permit, dictated the process that must be followed to characterize and to clean up sites where hazardous wastes were released.

EPA issued a Hazardous and Solid Waste Amendments permit to the Pinellas Plant on February 9, 1990. The flow chart on the next page presents the RCRA corrective action process. To ensure that public health and the environment were protected, the 15 areas of concern were designated as solid waste management units. On the basis of the information gathered during the RCRA Facility Assessment, DOE conducted a detailed assessment and characterization of the 15 solid waste management units from 1990 to 1992. Results of the detailed assessment and characterization, called a RCRA Facility Investigation, are documented in a RCRA Facility Investigation Report. EPA approved that report on March 9, 1993.

Information gathered in the RCRA Facility Investigation and from additional environmental investigations concluded that 11 of the 15 solid waste management units do not pose a threat to human health or the environment. On the basis of these findings, DOE recommended no further action for these 11 solid waste management units. No further action means that these solid waste management units do not pose a current or future threat to public health or the environment and no cleanup is



*Resource Conservation and Recovery Act corrective action process.*

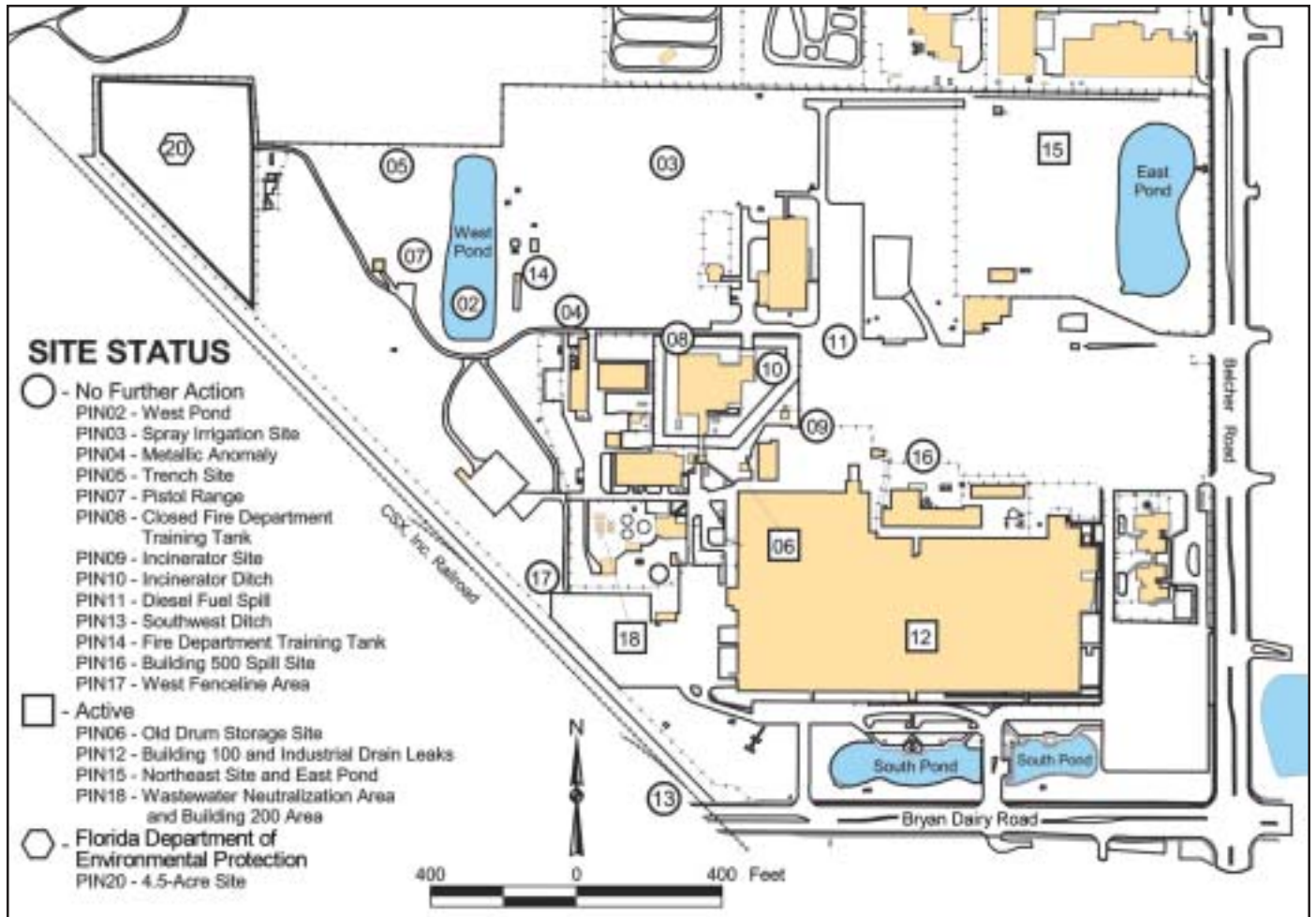
required. EPA and the Florida Department of Environmental Protection agreed with this recommendation. The solid waste management units approved for no further action are

- West Pond (PIN02)
- Spray Irrigation Site (PIN03)
- Metallic Anomaly (PIN04)
- Trench Site (PIN05)
- Closed Fire Department Training Tank (PIN08)
- Incinerator Site (PIN09)
- Incinerator Ditch (PIN10)
- Diesel Fuel Spill (PIN11)
- Southwest Ditch (PIN13)
- Fire Department Training Tank (PIN14)
- Building 500 Spill Site (PIN16)





Aerial view (early 1990s) of Young-Rainey STAR Center (right) and locations of solid waste management units (below).



The table on page 6 provides types of operations, dates of operation, hazards or contaminants of concern, acres or volumes of contamination, and phases of remediation for these 11 solid waste management units. These assessments form the basis for the submittal and approval of the no further action recommendation.

A 12th site, the Former Pistol Range Site (PIN07), was remediated (as an Interim Measure) in 1993 with the removal of lead-contaminated soil. After DOE confirmed that the lead levels in soil at this site were below background levels, DOE recommended the site for no further action. EPA Region IV and the Florida Department of Environmental Protection approved the recommendation as part of a Statement of Basis document for the now 12 no further action sites.

In accordance with the Hazardous and Solid Waste Amendments permit for the Pinellas Plant, DOE notified EPA on May 29, 1992, that another potential solid waste management unit was identified during routine groundwater monitoring. The area was designated as the West Fenceline Area (PIN17). As required by the permit, DOE assessed the area and submitted a report of the findings to EPA. On the basis of these results, the Hazardous and Solid Waste Amendments permit was updated to include the West Fenceline Area as a solid waste management unit. Cleanup of the West Fenceline Area was completed in 1997, at which time DOE recommended no further action. EPA and the Florida Department of Environmental Protection approved this recommendation.

On April 7, 1993, DOE notified EPA that two more potential solid waste management units were identified at the Pinellas Plant. The potential solid waste management units were the Wastewater Neutralization Area and the Building 200 Area. DOE submitted a RCRA Facility Assessment of these areas to EPA on March 15, 1994; EPA approved these areas as solid waste management units on April 20, 1994. EPA concurred with the DOE conclusion that a release of hazardous waste had occurred at the Wastewater Neutralization Area and the Building 200 Area. Because of the proximity of these two sites and similar contaminants, the Wastewater Neutralization Area and the Building 200 Area were designated as one solid waste management unit (PIN18).

A RCRA Facility Assessment and a RCRA Facility Investigation were completed for the Wastewater Neutralization Area. In keeping with the corrective action process under RCRA, a Corrective Measure Study and a Corrective Measure Implementation Plan were developed to address the contamination at the Wastewater Neutralization Area/ Building 200 Area. The Corrective Measure Study and Corrective Measure Implementation Plan were approved by EPA and the Florida Department of Environmental Protection in 1999.

## Status of No Further Action Solid Waste Management Units at Young-Rainey STAR Center

Solid Waste Management Unit	Operable Unit No.	Type of Operation	Dates of Operation	Hazards and Contaminants	Acres or Volumes	Phase
<b>West Pond</b>	PIN02	Man-made pond that received pH-neutralized industrial effluent and treated sanitary sewage.	1956–1982	No contaminant concentrations above protective standards.	1.5 acres	No further action.
<b>Spray Irrigation Site</b>	PIN03	Land treatment for pH-neutralized industrial effluent and treated sanitary sewage.	1972–1982	No contaminant concentrations above protective standards.	10 acres	No further action.
<b>Metallic Anomaly</b>	PIN04	A metallic anomaly identified during an electromagnetic survey performed by the United States Geological Survey.	N/A	None	1 acre	No further action. Metallic anomaly identified as a buried utility line; no environmental pathways are affected.
<b>Trench Site</b>	PIN05	Trenches thought to have received slurry waste from water softeners.	Late 1950s	No contaminant concentrations above protective standards.	1 acre	No further action.
<b>Former Pistol Range</b>	PIN07	Former small arms firing range for plant guards.	1972–1985	Lead	2.5 acres	Soil removed as an interim measure. No further action.
<b>Closed Fire Department Training Tank</b>	PIN08	Former location of fire training tank used for plant fire department.	Early 1960s–1973	No contaminant concentrations above protective standards.	100 square feet (ft <sup>2</sup> )	No further action.
<b>Incinerator Site</b>	PIN09	Areas associated with incinerators formerly located at Pinellas Plant.	1956–1982	No contaminant concentrations above protective standards.	600 ft <sup>2</sup>	No further action.
<b>Incinerator Ditch</b>	PIN10	Ditch that formerly received incinerator scrubber water and suspected small quantities of waste solvents.	1965–1970	No contaminant concentrations above protective standards.	1,500 ft <sup>2</sup>	No further action.
<b>Diesel Fuel Spill</b>	PIN11	Location of diesel fuel spill that occurred in 1983.	January 12, 1983	No contaminant concentrations above protective standards.	11,250 ft <sup>2</sup>	Contaminated soils were excavated. No further action.
<b>Southwest Ditch</b>	PIN13	Location of former pH-neutralized industrial and treated sanitary effluent outfall from the Pinellas Plant.	1957–1968	No contaminant concentrations above protective standards.	2,700 ft <sup>2</sup>	No further action.
<b>Fire Department Training Tank</b>	PIN14	Former location of fire training tank used by Pinellas Plant fire department.	1972–1988	No contaminant concentrations above protective standards.	2,700 ft <sup>2</sup>	No further action.
<b>Building 500 Spill Site</b>	PIN16	Former location of drain associated with compressor blowdown north of Building 500.	1964–1981	No contaminant concentrations above protective standards.	2.5 acres	No further action.

## 4.5-Acre Site

The 4.5-Acre Site, originally part of the DOE facility, was sold to a private individual in 1972. During the 1960s, the site was used for subsurface disposal of drummed waste solvent and waste resinous materials. Buried drums were uncovered during a geophysical survey of the area in 1984. Subsequently, 83 drums and 303 tons of soil were removed and disposed of at an EPA-approved disposal facility.

Continuation of 4.5-Acre Site assessment activities involved installing groundwater monitor wells in 1985. All phases of the site assessment, including identification of groundwater contamination, were reported in a Contaminant Assessment Report published in May 1986. The results presented in that report prompted DOE to complete a Feasibility Study. Several remedial alternatives were provided in the Feasibility Study Work Plan and the Feasibility Study report. The Feasibility Study report recommended hydraulic containment and recovery of the contaminated groundwater and on-site treatment. Currently, DOE leases the site from the landowner and is actively pursuing groundwater cleanup. Groundwater cleanup at the 4.5-Acre Site is proceeding according to provisions in the "Remediation Agreement for the Four and One-Half Acre Site in Largo," dated 2001, between DOE and the State of Florida. The remediation agreement required DOE to prepare a Remedial Action Plan for the site. This plan evaluated groundwater cleanup alternatives and recommended the preferred remedial action to clean up the groundwater beneath the site to levels that are protective of public health. The Remedial Action Plan was approved by the Florida Department of Environmental Protection in August 2001. The recommended remedial action was installation and implementation of an in situ biosparge treatment system that became operational in November 1999.

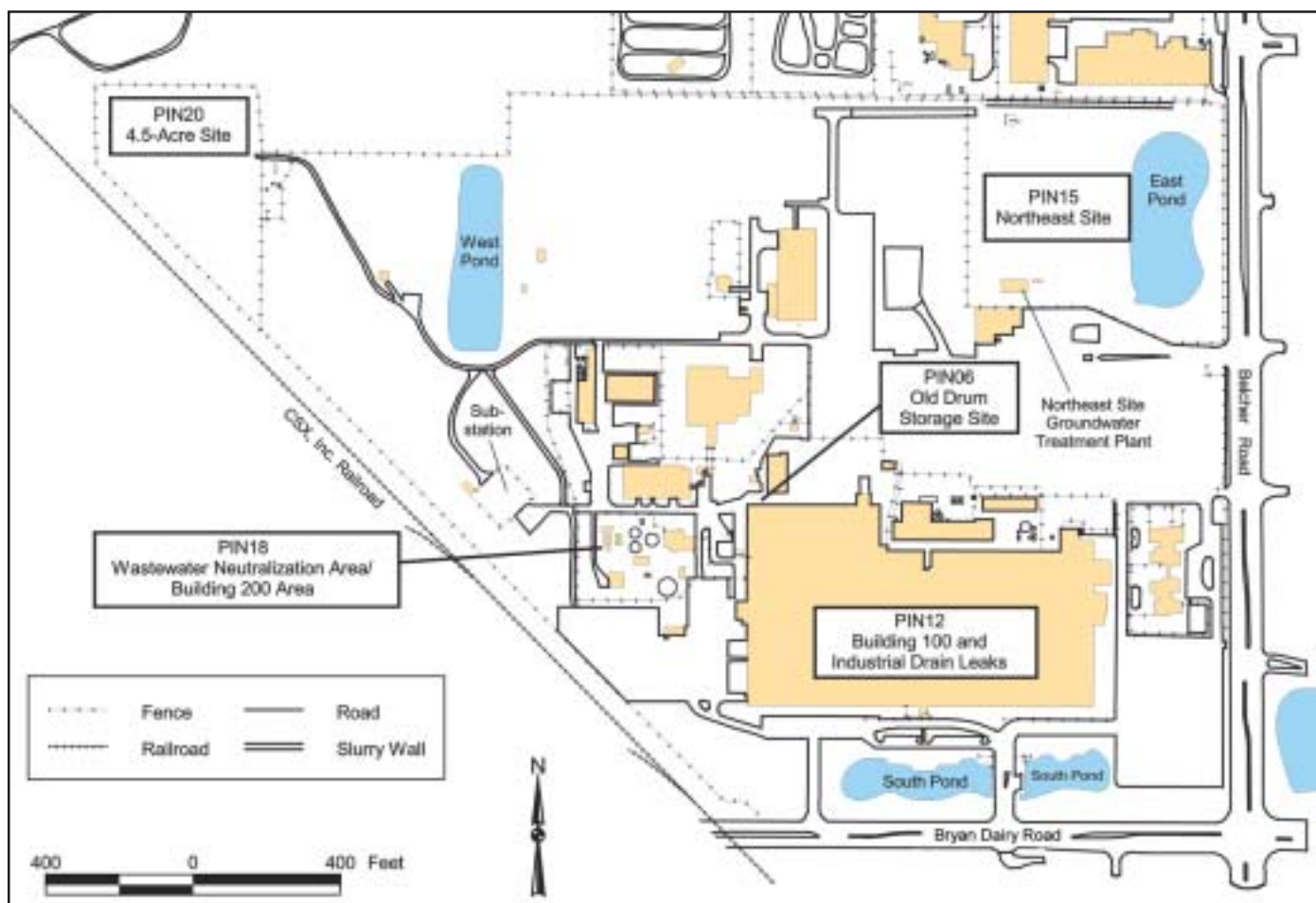


*Drilling a horizontal well at 4.5-Acre Site.*

## Status of Solid Waste Management Units

Four solid waste management units at the STAR Center—the Old Drum Storage Site (PIN06), the Building 100 Area and Industrial Drain Leaks (PIN12), the Northeast Site and East Pond (PIN15), and the Wastewater Neutralization Area and Building 200 Area (PIN18)—have contamination in groundwater in the surficial aquifer at levels in excess of protective standards. These four solid waste management units (see figures on page 4 and page 8) were recommended for or are undergoing remediation.





*Locations of 4.5-Acre Site and active solid waste management units at Young-Rainey STAR Center.*

Two solid waste management units, the Old Drum Storage Area (PIN06) and the Building 100 Area and Industrial Drain Leaks (PIN12), are currently being remediated together because of similarities in groundwater contamination and the proximity of these two sites. These two solid waste management units are collectively known as the Building 100 Area.

### ***Building 100 Area (PIN06 and PIN12)***

The Building 100 Area (PIN06 and PIN12) is located in the southeast portion of the STAR Center. The Old Drum Storage Area, near the northwest corner of Building 100, is the former location of a concrete storage pad that was equipped with a drain and containment system and was used to store hazardous waste. Empty drums containing residual waste solvents were also stored in this area. The pad was removed in October 1983 in accordance with a Florida Department of Environmental Protection closure permit; a closure report was submitted to the Florida Department of Environmental Protection in August 1986. Closure of the pad removed the potential for a future contaminant source at the Old Drum Storage Area.

Building 100 is the largest building on site and occupies approximately 11 acres. The solid waste management unit associated with this building is a consequence of leakage from the liquid-waste drainage system that serves Building 100 and is located beneath the structure. Four individual drainage systems—sanitary, chemical, health physics, and storm water—were present within the building. In 1989, all four drainage systems were investigated, including verifying routes of the individual systems and the conditions of underground and aboveground piping and ancillary equipment. As a result of this investigation, the health physics and chemical drain lines were replaced by an aboveground system.

A Corrective Measure Study and a Corrective Measure Implementation Plan were completed and approved for the Building 100 Area because contaminant concentrations measured in groundwater at the Old Drum Storage Site (PIN06) exceeded Safe Drinking Water Act and Florida Department of Environmental Protection maximum contaminant levels. Contaminant concentrations measured in groundwater samples from monitor wells located beneath and adjacent to the northwest corner of Building 100 (PIN12) exceed the Solid Waste Disposal Act and Florida Department of Environmental Protection maximum contaminant levels.

The remediation alternative currently being implemented for the Building 100 Area consists of pumping the contaminated groundwater and aboveground treatment with an air-stripper system. Two groundwater recovery wells at the northwest corner extract the contaminated groundwater that is pumped to an air-stripper system at the Northeast Site. DOE has begun an intensive evaluation of potential remediation strategies to expedite cleanup of groundwater contamination beneath and adjacent to Building 100. The initial focus of the evaluation was a review of the need to further retard the potential for off-site migration of contaminants. This review was completed by DOE in April 2001 and submitted at that time to the Florida Department of Environmental Protection. Upon Florida Department of Environmental Protection concurrence, DOE will proceed to final selection of a plume control technology, which is expected to be implemented in fiscal year 2003. A review of potential technologies to address treatment of the contamination beneath the building is ongoing at this time.

### ***Northeast Site (PIN15)***

In the late 1960s before construction of the East Pond, drums of waste and construction debris were disposed of in the swampy area of the Northeast Site. The East Pond was excavated in 1968 as a borrow pit. An expansion of the East Pond was initiated in 1986 to create additional storm-water retention capacity. Excavation activities ceased when contamination was detected directly west of the East Pond.

*Recovery well vault at Building 100.*



*Northeast Site groundwater treatment plant.*



Removal of packing media from air-stripper tower at Northeast Site.



Debris removal at Northeast Site.

The Northeast Site was identified as a solid waste management unit in 1987 as part of the RCRA Facility Assessment. An Interim Corrective Measurement Study was prepared and submitted to EPA in October 1991. An interim corrective measures system for groundwater recovery at the Northeast Site was installed; operation of the system started in January 1992. Recovered groundwater was piped to the 4.5-Acre Site where it was combined with contaminated groundwater from the 4.5-Acre Site and run

through the air stripper. Implementation of this interim corrective measures system at this site was consistent with the regulatory goals of the EPA-proposed RCRA Corrective Actions (Subpart S). The interim corrective measures system, as initially installed, consisted of four recovery wells equipped with pneumatic recovery pumps, a holding tank, centrifugal transfer pumps, and approximately 2,500 feet of transfer and secondary containment piping. During 1993, DOE proposed a reconfigured system of four shallow and three deep recovery wells for the site. After EPA approved the system upgrade, the system was reconfigured and became operational on March 1, 1994.

Between August and October 1995, EPA and the Florida Department of Environmental Protection gave the approval to excavate a portion of the Northeast Site to remove debris and other materials that could inhibit

future corrective measures. The areas of excavation were selected based on results of a geophysical survey and knowledge of existing utility locations. Detailed descriptions of the debris removal activities were submitted to EPA and the Florida Department of Environmental Protection as part of the *Northeast Site Interim Measures Quarterly Progress Report* of January 1996.

In September 1993, the DOE Innovative Treatment Remediation Demonstration (ITRD) Project initiated a project at the Pinellas Plant. Groundwater in a shallow, sandy aquifer at the Northeast Site (PIN15) is contaminated with chlorinated volatile organic compounds. Advisory groups composed of DOE, EPA, industry, and State and Federal regulatory representatives worked with the site DOE Environmental

Restoration Project to review and evaluate approximately 20 potentially applicable innovative remediation technologies that could lower the cost or improve the performance of the existing pump-and-treat system. On the basis of this technology review and associated treatability studies, the Pinellas Environmental Restoration Project selected three technologies for implementation: dual-auger rotary steam stripping, anaerobic bioremediation, and pervaporation. These technology demonstrations were conducted in 1996 and 1997. A summary of the results is presented in reports prepared by ITRD. These reports are available on the Internet at <http://www.gjo.doe.gov/Pinellas/ref.htm>. Additional information about the technology demonstrations is available on the Internet at <http://www.em.doe.gov/itrd/pine.html>.

In 1996, DOE submitted a Corrective Measures Implementation Plan to EPA Region IV and the Florida Department of Environmental Protection for the Northeast Site. This plan, which recommended a pump-and-treat groundwater recovery system, was approved by both regulatory agencies in 1996. Installation of an air stripper at the Northeast Site in 1997 allowed on-site treatment of contaminated groundwater instead of at the 4.5-Acre Site. Organic compounds in the groundwater recovered at the Northeast Site are volatilized in an on-site air stripper.

In the late 1990s, DOE determined that both light and dense non-aqueous phase liquids were present at the site. An extensive evaluation of treatment technologies was undertaken; an in situ thermal process was selected as the preferred method to remove these compounds. In 2001, an Interim Remedial Measures Work Plan was submitted to the Florida Department of Environmental Protection. This plan was approved by the Florida Department of Environmental Protection in January 2001. Implementation of the thermal treatment technologies is expected to begin in September 2002 and to be completed in 2006.



*Sampling activities at Wastewater Neutralization Area.*

### ***Wastewater Neutralization Area/Building 200 Area (PIN18)***

The Wastewater Neutralization Area/Building 200 Area consists of the active Wastewater Neutralization Facility, the area around Building 200, and the area south of the Wastewater Neutralization Facility. The Wastewater Neutralization Facility, a physical treatment plant that currently receives sanitary and industrial wastewater, has been in operation since 1957.

A Corrective Measures Study Report and Corrective Measures Implementation Plan were completed in 1997 for this solid waste management unit because contaminant concentrations above Federal and State maximum contaminant levels were detected in groundwater samples from the surficial aquifer. The recommended cleanup alternatives for the Wastewater Neutralization Area/Building 200 Area are recovery wells located in the Wastewater Neutralization Facility. Groundwater recovered from the recovery wells is discharged directly to the Pinellas County publicly owned treatment works.

**Dual-auger steam stripping:** Injection of steam and hot air at multiple locations through twin 5-foot-diameter augers. Contaminants vaporize, rise up the borehole, are captured in a large hood, and are then treated before release to the environment.

**Anaerobic bioremediation:** In situ bioremediation in an oxygen-deficient environment. Nutrients are injected and circulated throughout the area of contamination to enhance the natural biological degradation processes.

**Pervaporation:** An ex situ process that separates the water and the contaminants through the use of hydrophobic organic-permeable membranes. The membranes hold the water back but allow the passage of organic chemicals, thus the separation.



*Drilling at Northeast Site.*

## Conclusion

Remediation systems at the STAR Center are constantly being evaluated to address changing needs, availability and appropriateness of improved technologies, and regulatory agency concerns. Currently, DOE oversees environmental restoration activities at the STAR Center that are expected to continue until 2014. Active remediation is ongoing at each of the sites discussed, along with the program to reduce the time (through technology enhancements) required for cleanup and to reduce the cost to the government.

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